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NOISE INSULATION OF RESIDENCES AROUND KASTRUP AIRPORT OF COPENHAGEN

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INTRODUCTION

In Denmark plans existed for many years to move the Copenhagen International Airport from Kastrup to an Island in the Sound called Saltholm. However, as a result of the economic recession, it was decided in 1981 to drop the plans and instead to extend the existing Kastrup Airport.

STATE AIDS TO NOISE INSULATION

As a compensation to those, who lived in the noise areas around Kastrup Airport the Government at the same time offered grants of the costs involved in noise insulation of their residences. Totally 4700 residences got the offer. The total amount reserved for this purpose was 105 million D.kr., in a 5-year period.

How much is paid?

In the table below is shown which grants is offered (below a maximum amount for the grant) for the 3 noise zones around the airport.

Noise level L_{DEN}	Number of residences	Offered grants of the noise insulation costs	Maximum amount
>75 dBA	300	90 %	72.000 D.kr.
70-75 dBA	1100	75 %	53.000 D.kr.
65-70 dBA	3300	70 %	36.000 D.kr.

Grants is given for all residences used all the year, inside the 3 noise zones, to insulation of living rooms and sleeping rooms, but not kitchen and other rooms which only in some extent is used for living.

IMPLEMENTATION OF THE SCHEME

The scheme is administrated under the National Agency of Environmental Protection (NAEP). The purpose of the scheme is to reduce the indoor noise level as much as possible to a minimum cost but at least 7-10 dBA.

Procedure to get grant for insulation

The homeowners who want to avail themselves of the offer, contact the NAEP's consultant (Johannes Jørgensen A/S). Having inspected the house in question, the consultant draws up an insulation plan describing the measures which, given the economic possibilities, offer the optimal solution and at least 7-10 dBA reduction.

This is calculated (pr. 1/1 octave) from the knowledge of how much the single building-component do relatively contribute to the transmission of aircraft noise to the room in question.

Then the houseowner asks a local contractor to estimate the costs. The estimate is considered by the consultant, who may recommend the NAEP to grant the support.

When the work has been completed by the contractor, the consultant surveys it before the money is paid to the houseowner.

The "Kastrup catalogue"

To assist contractors in their estimate of insulation costs, the NAEP has made an inventory of the commonest building elements relevant to the transmission of sound, and thus, to the indoor noise level, and their insulation effect (I-value). The inventory (the "Kastrup catalogue") further gives proposals for measures to improve the noise insulation of the building elements by 5, 10 and possibly 15 dB. "The Kastrup catalogue" serves mainly as a basis of communication between the consultant and the contractor.

As an example, the insulation plan made of the consultant can describe the measures to be taken, to be that the existing windows type V1 should be insulated as shown as a proposal type V1-4 in the "Kastrup catalogue".

Use of the offer until now

Until now (March 1981) 2400 of the possible 4700 residences have been inspected by the consultant, 1400 residences have got accept from NAEP of grants for insulation and about 500 residences are insulated and the grants paid out. The work is mainly done by small, local artisanfirms of which more than 50 are until now involved.

What is done and how does it work?

Most of the insulation plans involve change of windows to such ones, whose insulation effect is $I_a = 36-38$ dBA, and insulation of the ceiling. A few measurements of the insulation before and after the work has been showing a good correlation to the expected effect.

SOCIAL SURVEY TO EVALUATE THE EFFECT OF NOISE INSULATION

To see whether the residents consider the noise insulation as a significant improvement, at social survey including 525 households is made in the area, and the residents are interviewed both before and after the noise insulation.

Preliminary results

The survey before the insulation has been done in the 2 nearest noise zones. This survey has shown that 97% are in general content with their residence, even if 74% seemed the surroundings were noisy and 45% spontaneously named aircraft noise as a thing they were not content with. 55% mentioned that they were "much" or "something" annoyed of aircraft noise, mostly in the summer (May-August inclusive) and mostly from take-offs. 50% said they were annoyed in the last week. About 30% thought the noise was most annoying in the afternoon and the evening (3-10 p.m.) and only 12% that the night (11 p.m. - 5 a.m.) was most annoying. - 60% pointed out separate aircraft types as specially annoying. (This types has not yet been described). This can be related to the fact that 64% said that the aircraft manufactories ought to do more to reduce the aircraft noise, and that 29% said that the authorities ought to forbid the most noisy aircraft types. 23% said that they or members of their family was working in the airport.

Influence of aircraft noise on activities

In the table below is shown how many is saying the aircraft noise have influence on different activities.

Activity	Part who say, that aircraft noise do have influence
Sitting outdoor	32 %
Open windows in night	23 %
Open windows in day	21 %
Telephone conversation	55 % (24 % only with open windows)
Television listening	49 %
Radio listening	40 %
Reading	13 %
Conversation	62 % (11 % only with open windows)
Visitors annoyed	80 %

This year (1983) a further survey before the insulation may be done in the area with 65 dBA_{L_{DEN}} <70 dBA; 1984 and 1986 social surveys will be done after the insulation at the same people, to get informations to see whether the residents consider the noise insulation as a significant improvement.
